

CLAIMS

1. A method for backing up a primary logical unit within a data storage device, the primary logical unit and a backup logical unit together comprising a mirror-
5 logical-unit pair, the method comprising:

receiving a trigger I/O request by the data storage device;

inserting a TRIGGER message corresponding to the I/O request into a queue that contains a portion of a sequenced stream of I/O requests directed to the primary logical unit;

10 dequeuing the TRIGGER message from the queue, and initiating a mirror split operation directed to the primary logical unit;

sending the TRIGGER message to the backup logical unit; and

after completion of the mirror split operation, maintaining the backup logical unit as a backup copy of the primary logical unit.

15 2. The method of claim 1 wherein the backup logical unit is an active member of a pool of backup logical units managed by a controller of the data storage device.

3. The method of claim 2 further including:

20 upon receiving the TRIGGER message by a controller handling the backup logical unit,

deactivating the active backup logical unit;

activating a least recently active backup logical unit within the pool of backup logical units; and

25 synchronizing the activated backup logical unit with the primary logical unit; and

receiving and executing mirror I/O requests on the activated backup logical unit.

4. The method of claim 1 wherein the backup logical unit is a primary backup logical unit associated with a pool of backup logical units including an active backup logical unit and inactive backup logical units.

5. The method of claim 1 wherein the primary logical unit is associated with a local pool of backup logical units and with a remote primary backup logical unit associated with a remote pool of backup logical units.

6. The method of claim 1 wherein the primary logical unit is distributed among multiple data storage devices.

7. The method of claim 6 wherein the TRIGGER message is inserted into queues within the multiple data storage devices.

8. The method of claim 1 wherein the backup logical unit is distributed among multiple data storage devices.

9. The method of claim 8 wherein the TRIGGER message is inserted into queues within the multiple data storage devices.

10. The method of claim 1 wherein the trigger I/O request is a special request comprising one of:

an I/O request transmitted to a special logical unit provided by the data storage device;

an I/O request transmitted to the primary logical unit by a special path;
a special TRIGGER I/O request transmitted to the primary logical unit; and
an I/O request transmitted to the data storage device on a separate communications medium.

11. A data storage device that provides efficient backup generation to an external program running on a host computer, the data storage device comprising:

a primary logical unit that, together with a backup logical unit, comprises a mirrored logical-unit pair; and

5 a controller that receives and recognizes a trigger I/O request directed to the primary logical unit, queues a TRIGGER message corresponding to the trigger I/O request in sequence with other received I/O requests, and initiates a mirror split operation directed to the mirrored logical-unit pair when the TRIGGER message is dequeued by the controller for execution.

12. The data storage device of claim 11 wherein the controller forwards the
10 TRIGGER message to the backup logical unit in sequence with other received I/O requests forwarded by the controller to the backup logical unit.

13. The data storage device of claim 11 wherein the trigger I/O request is a special request comprising one of:
15 an I/O request transmitted to a special logical unit provided by the data storage device;
an I/O request transmitted to the primary logical unit by a special path;
a special TRIGGER I/O request transmitted to the primary logical unit; and
an I/O request transmitted to the data storage device on a separate
20 communications medium.

14. A data storage device that provides efficient backup generation to an external program running on a host computer, the data storage device comprising:
an ordered pool of backup logical units, one of which is a currently active
25 backup logical unit that mirrors a primary logical unit; and
a controller that receives and recognizes a trigger MESSAGE directed to the active backup logical unit, queues the TRIGGER message in sequence with other received I/O requests, and that, upon dequeuing the TRIGGER message for execution,
deactivates the currently active backup unit,
30 synchronizes a least recently active inactive backup logical unit with the primary logical unit, and

activates the least recently active inactive backup logical as the currently active backup logical unit.

15. The data storage device of claim 14 wherein the primary logical unit is
5 contained within the data storage device.

16. The data storage device of claim 14 wherein the primary logical unit is contained within a remote data storage device.

10 17. The data storage device of claim 14 wherein the data storage device further includes a primary backup logical unit that mirrors the primary logical unit in addition to the ordered pool of backup logical units.